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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,764	07/25/2001	Apostolis Papathanasiou	HER-1	5067
7590	04/23/2004		EXAMINER	
Hung Chang LIN 8 Schindler Court Silver Spring, MD 20903			DO, CHAT C	
			ART UNIT	PAPER NUMBER
			2124	
			DATE MAILED: 04/23/2004	

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	09/911,764	PAPATHANASIOU, APOSTOLIS
	<b>Examiner</b>	<b>Art Unit</b>
	Chat C. Do	2124

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 07/25/01; 09/05/01; 10/01/01.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-19 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-19 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 10 October 2001 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
	6) <input type="checkbox"/> Other: _____

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The information disclosure statement filed 07/25/2001 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the reference list is improper. A PTO-1449 form is required to include all the presented references. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609 ¶ C(1).

### ***Claim Objections***

2. Claims 5 and 14 are objected to because of the following informalities:

Claim 5 is missing in the present application.

The term “CLESS” in line 1 should rewrite as “constrained Least Square Solver” in claim 14.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 12-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 12, the limitation "the group" in line 1 lacks an antecedence basis. For examination purposes, the examiner considers the limitation as a group.

Re claim 13, it is indefinite by the limitation "the group is ... QR Decomposition (QRD)". For examination purposes, the examiner disregards this limitation.

#### ***Claim Rejections - 35 USC § 101***

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1-14 and 19 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-14 and 19 clearly recite a method for adapting a linear systems according to a mathematic algorithm. However, in order for such a claimed method, computer-related process, or a claimed non-specified apparatus implementing the underlined process to be statutory, the claims must include either a step or means that results in a physical transformation outside the computer or a limitation to a practical application. However, it is clear from the claims that the claims merely recite step or non-specific means for data computation and manipulation in performing a mathematical

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function. The input is a set of numbers and output is also a set of numbers. The claims fail to recite any step or means that results in a physical transformation outside the computer, that includes a limitation to a practical application, or that requires a specific computer to implement the claimed process. Therefore, claims 1-14 and 19 are clearly directed to a non-statutory subject matter.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-4, 6, 9-10, 11-12, 14, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Martin et al. (“Unitary ESPRIT: How to Obtain Increased Estimation Accuracy with a Reduced Computational Burden”).

Re claim 1, Martin et al. disclose a method for adapting a linear systems (right column bottom paragraph) to a set of observations with a Least Square Solver (LESS) having adaptation parameters with complex-valued elements (table 1 in page 1239), comprising the steps of transforming adaptation parameters from a complex arithmetic to two sets of real number arithmetic by means of binary orthogonalization transformation (BOT) (equation 7 in page 1234 and right column lines 3-8 page 1232), computing with LESS two sets of real number arithmetic (equation 7); and transforming after computing

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with LESS two sets of real number computation to complex number arithmetic using an inverse binary orthogonalization transform (IBOT) (right column lines 8-10 page 1232).

Re claim 2, Martin et al. further disclose computing of two sets of real number arithmetic are applied in parallel (equation 7 wherein matrix T(G) is operated in parallel manner).

Re claim 3, Martin et al. further disclose computing of two sets of real number computation LESS are applied in series (equation 7 wherein matrix T(G) is operated in series manner).

Re claims 4 and 6, Martin et al. further inherently disclose the LESS represents a Recursive Least Squares and Least Mean Squares (LMS) algorithms wherein these two algorithms are known and computed as Least Square Solver.

Re claim 9, Martin et al. further disclose LESS is a Singular Value Decomposition (SVD) (right column page 1232 last paragraph).

Re claim 10, Martin et al. further disclose LESS is a QR Decomposition (QRD) (right column page 1232 line 5 from bottom).

Re claim 11, Martin et al. further disclose the RLS (algorithm) is computed by a systolic array (right column page 1232 lines 1-4 from bottom).

Re claim 12, Martin et al. further inherently disclose the LESS represents the group consisting of a Block Matched Filter Estimator (BMFE), a Block Zero Forcing Estimator (BZFE), and a Block Minimum Mean Square Error Estimator (BMMSEE) wherein each of these adaptive algorithms constrains itself in a least square manner.

Re claim 14, Martin et al. further disclose LESS is constrained as CLESS in that an initial BOT from complex number arithmetic to real number arithmetic is used (abstract in page 1232); then two real computation CLESS are applied (equation 7 in page 1234), each one producing P output streams ( $T(G)$ ); and finally a corresponding number of P MOT modules from real number arithmetic to complex number arithmetic are implemented (right column lines 8-10 page 1232).

Re claim 19, it is an apparatus claim of claim 1. Thus, claim 19 is also rejected under the same rationale in the rejection of rejected claim 1.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 7-8 and 15-18 are rejected under 35 U.S.C. 103(a) as being obvious over Martin et al. ("Unitary ESPRIT: How to Obtain Increased Estimation Accuracy with a Reduced Computational Burden").

Re claims 7-8, Martin et al. do not disclose LESS is a Householder transformation nor a Cholesky decomposition. However, the examiner takes an office notice that the Householder transformation and Cholesky decomposition are two well-known mathematically algorithms for decomposition factorization matrices. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is

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made to use the Householder transformation and Cholesky decomposition for computing in Martin et al.'s invention because they would enable to efficiently process the large matrices.

Re claims 15-18, Martin et al. do not disclose linear system is applied for the group consisting of temporal, spatial, joint temporal, spatial channel estimation, spatial channel equalization, carrier frequency estimation, Direction of Arrival (DOA) estimation, and joint carrier frequency and DOA estimation, and an adaptive filter. However, computation of the temporal, spatial, joint temporal, spatial channel estimation, spatial channel equalization, carrier frequency estimation, Direction of Arrival (DOA) estimation, and joint carrier frequency and DOA estimation, and an adaptive filter are known in the art to use an adaptive algorithm. Therefore, it would have been obvious applications to a person having ordinary skill in the art at the time the invention is made to apply the above algorithm to the temporal, spatial, joint temporal, spatial channel estimation, spatial channel equalization, carrier frequency estimation, Direction of Arrival (DOA) estimation, and joint carrier frequency and DOA estimation, and an adaptive filter application because it would enable to reduce the complexity of computing the estimated signals.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do  
Examiner  
Art Unit 2124

April 16, 2004



TODD INGBERG  
PRIMARY EXAMINER